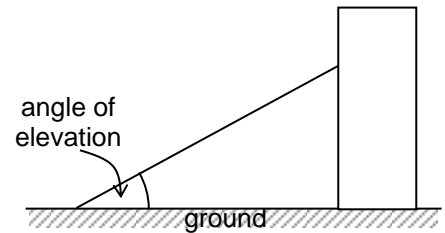


Applying Trigonometry

Some Important terms:

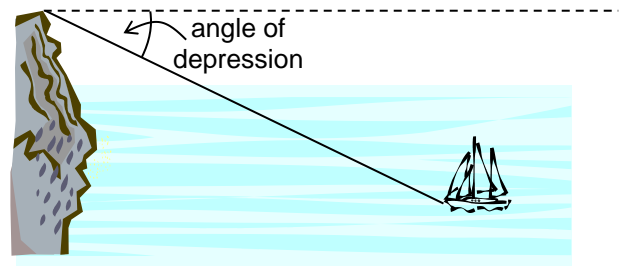
Angle of Elevation

The angle of elevation is the angle of view from the horizontal up to the object being viewed.



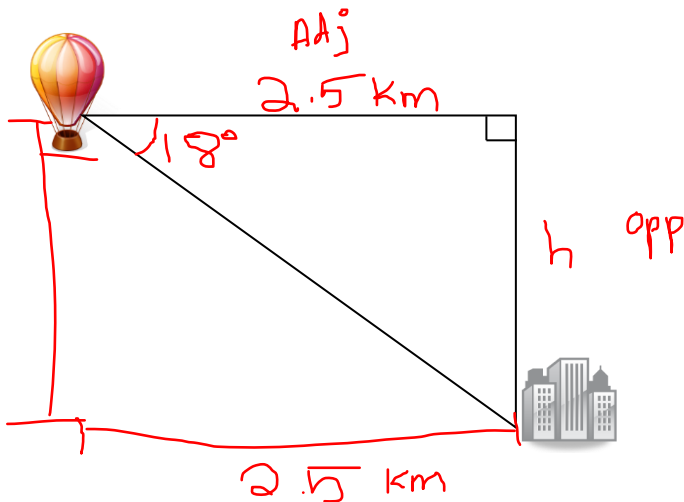
Angle of Depression

The angle of depression is the angle of view from the horizontal down to the object being viewed.



Example 1

Alex and Jon decide to go on a nice balloon ride together. They take off from a spot that is 2.5 km from town. After five minutes of rising straight up, Alex looks over the edge and can see the town. If the angle of depression is 18° , how high are Alex and Jon?



Steps:

- 1) Draw the diagram to show the facts given
- 2) Let x represent the side opposite to the angle of depression
- 3) Solve for x

$$\tan \theta = \frac{O}{A}$$

$$2.5 \cdot \tan 18 = \frac{h}{2.5}$$

$$2.5 \tan 18 = h$$

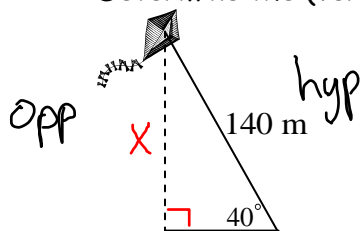
$$h \approx 0.8$$

∴ the balloon is 0.8 km in the air.

Applying Trigonometry

Example 2

Katie is flying a kite with a string that is 140 m long. The angle of elevation to the kite is 40° . Determine the (vertical) height of the kite.



$$\sin \theta = \frac{O}{H}$$

$$140 \cdot \sin 40^\circ = \frac{X}{140}$$

$$140 \sin 40 = X$$

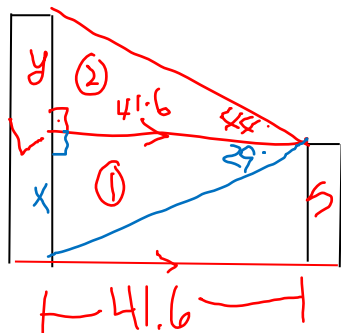
$$X = 89.99$$

$$X \approx 90$$

- Therefore, the kite is approximately 90 m high.

Example 3 - Extension if you have time...

Two buildings are 41.6 m apart. From the roof of the shorter building, the angle of elevation to the top of the taller building is 44° . The angle of depression to the base of the taller building is 29° . Find the heights of the buildings to the nearest tenth of a metre.



Δ ①

$$\tan \theta = \frac{O}{A}$$

$$41.6 \cdot \tan 29^\circ = \frac{X}{41.6}$$

$$41.6 \tan 29^\circ = X$$

$$X \approx \underline{23.06}$$

Δ ②

$$\tan \theta = \frac{O}{A}$$

$$41.6 \cdot \tan 44^\circ = \frac{y}{41.6}$$

$$41.6 \tan 44^\circ = y$$

$$y \approx \underline{40.17}$$

∴ the small building is 23.06 m and the tall building is 63.23 m

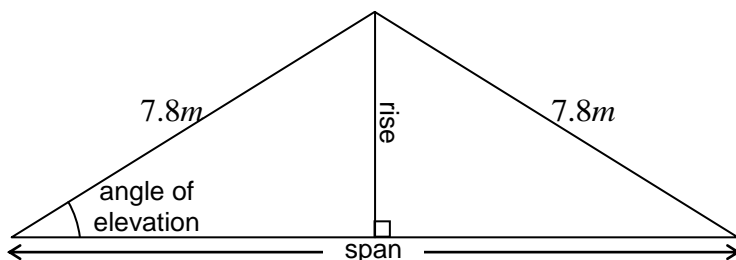
Applying Trigonometry

1. From a point 18 m away from the base of a monument, the angle of elevation to the top is 27° . Calculate the height of the monument.



$$\tan 27^\circ = \frac{h}{18}$$

2. While on vacation, Sara measured the angle of elevation of the Eiffel Tower to be 63° . She was 97.7 m from the base of the tower when she made this measurement. How tall is the Eiffel Tower?
3. From a point 132 m above the ground in a control tower, the angle of depression to an airplane on the ground is 38° . How far is the airplane from the control tower?
4. At a concert, Tony is sitting 40 m away from the stage. He is 10 m above the level of the stage. At what angle of depression is he watching the band?
5. A house gable has rafters 7.8 m long and a span of 9.5 m .
- Find the angle of elevation.
 - Find the rise.



Solutions

1. 9.2 m	2. 191.7 m	3. 169 m	4. 14°	5. $52^\circ, 6.2\text{ m}$
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Extra textbook practice: p. 86 # 1-11